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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/734,803
Filing Date: December 12, 2003
Appellant(s): CENTANNI ET AL.

Eamon J. Wall
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 27 August 2008 appealing from the Office action mailed 31 March 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6424774	Takeda et al.	7-2002
2004/0100681	Bjarklev et al.	5-2004
5943149	Cearns et al.	8-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4, 8-10, 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda et al. ("Takeda") (US Patent No. 6424774) in view of Bjarklev

et al. ("Bjarklev") (US Patent Application Publication No. 2004/0100681) and further in view of Cearns et al. ("Cearns") (US Patent No. 5943149).

Regarding claim 1, Takeda discloses an optical switch, comprising: a first optical combiner for combining an input data signal with two pump signals, alternatively with each pump signal, to produce a combined signal (fig. 3, elements 22, 24, 25 and 27 and col. 4, line 31 to col. 5, line 29), a non-linear optical element for imparting a non-linear effect on the combined signal to generate a number of optical bands based on simultaneous interaction of one of the pump signals and the data signal (fig. 3, elements 21 and col. 4, line 31 to col. 5, line 29); and at least one optical splitter for separating the combined signal from said non-linear optical element into optical bands (fig. 3, element 23 and col. 5, lines 6-22, where the BPF splits both λ_{c1} and λ_{c2} from the combined signal); wherein at least one of said at least two optical pump signals is controllably modulated such that a logic sequence of said input data signal is controllably switched (fig. 3, element 27 and col. 5, lines 6-22). Takeda does not disclose combining two pumps into a first combined signal and then combining the first combined signal with the data signal to generate the optical bands based on a simultaneous three-signal interaction. Takeda discloses two pumps signals, but only one pump signal at a time is combined with the data signal. Bjarklev discloses using two pumps signals together in a four-wave mixer (paragraph 0002). It would have been obvious to one of ordinary skill in the art at the time of the invention to add an additional pump signal in Takeda, combining it with each alternating pump signal by coupling the additional pump signal to the output of the selector, to provide the benefit of ensuring polarization insensitive

operation, as taught by Bjarklev. Takeda discloses that the BPF splits out the two converted data signals from the combined signal, but does not disclose that that splitter splits out the pump wavelength as well. Cearns discloses an optical BPF that passes the filter wavelengths through and reflects the unfiltered wavelengths (fig. 4 and col. 5, lines 23-50). One of ordinary skill in the art at the time of the invention could have used a BPF like that of Cearns for the BPF of the combination and the results of the substitution would have been predictable; namely, the pump signal would be reflected instead of blocked. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a BPF like that of Cearns for the BPF of the combination for the predictable result of reflecting the pump signal instead of blocking it.

Regarding claim 2, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 1, further comprising at least two optical pump sources, each of said sources providing one of said at least two optical pump signals, wherein at least one of said at least two optical pump sources is adapted to controllably modulate its respective optical signal such that a logic sequence of said input data signal is controllably switched and an output signal of said optical switch comprises a multi-band switched optical signal (Takeda: fig. 3 and col. 4, line 31 to col. 5, line 29)

Regarding claim 4, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 2, further comprising a controller for controlling the modulation of the at least one modulated optical pump source (Takeda: fig. 3, where the control signal indicates a controller).

Regarding claim 8, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 1, wherein said non-linear optical element comprises a highly non-linear fiber (Takeda: col. 2, lines 62-65).

Regarding claim 9, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 1, wherein said non-linear optical element generates a parametric amplification of the combined signals (Takeda: col. 4, line 31 to col. 5, line 29 and Bjarklev: paragraph 0002, as applicable in the combination).

Regarding claim 10, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 9, wherein said non-linear effect comprises difference frequency generation (Takeda: col. 4, line 31 to col. 5, line 29).

Regarding claim 14, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 9, wherein each wavelength of said input data signal is converted into a corresponding wavelength in said respective generated optical bands (Takeda: col. 4, line 31 to col. 5, line 29).

Regarding claim 15, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 2, wherein said optical pump sources comprise laser sources (Takeda: fig. 3, elements 22).

Regarding claim 16, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 1, and discloses that said first optical combiner comprises a band splitter (Takeda: fig. 3, element 25 and col. 4 lines 58-61, where the wavelength multiplexer reads on a band splitter used to multiplex instead of demultiplex), but the combination as described above does not disclose that the additional pump signal

coupled to the output of the selector is combined using a band splitter. However, one of ordinary skill in the art at the time of the invention could have using a wavelength multiplexer like that of fig. 3 element 25 to couple the additional pump wavelength of the combination to the output of the selector as described above, and the results would have been predictable. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to couple the additional pump wavelength of the combination to the output of the selector using a wavelength multiplexer, for the predictable result of achieving a single multi-wavelength signal.

Regarding claim 17, the combination of Takeda, Bjarklev and Cearns discloses the optical switch of claim 1, wherein said at least one optical splitter comprises a band splitter (Takeda: fig. 3, element 23 and Cearns: fig. 4 and col. 5, lines 23-50, as applicable in the combination).

Regarding claim 18, Takeda discloses a method of optical switching using a fiber parametric device having at least two optical pump sources, comprising: combining an input data signal with two pump signals, alternatively with each pump signal, to produce a combined signal (fig. 3, elements 22, 24, 25 and 27 and col. 4, line 31 to col. 5, line 29), imparting a non-linear effect on the combined signal to generate a number of optical bands based on simultaneous interaction of one of the pump signals and the data signal of (fig. 3, elements 21 and col. 4, line 31 to col. 5, line 29); and controllably modulating at least one of said at least two pump sources such that a logic sequence of said input data signal is controllably switched (fig. 3, element 27 and col. 5, lines 6-22). Takeda discloses two pumps signals, but only one pump signal at a time is combined

with the data signal. Takeda does not disclose combining two pumps into a first combined signal and then combining the first combined signal with the data signal to generate the optical bands based on a simultaneous three-signal interaction. And Takeda discloses that the BPF splits out the two converted data signals from the combined signal, but does not disclose that that splitter splits out the pump wavelength as well. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Bjarklev and Cearns with Take as described above for claim 1.

Regarding claim 19, the combination of Takeda, Bjarklev and Cearns discloses the method of claim 18, further comprising separating said generated optical bands using one or more band splitters (Takeda: fig. 3, element 23 and col. 5, lines 6-22, where the BPF splits both λ_{c1} and λ_{c2} from the combined signal).

Regarding claim 20, the combination of Takeda, Bjarklev and Cearns discloses the method of claim 19, wherein said non-linear effect generates a parametric amplification of said combined signal such that an output of said fiber parametric device comprises one or more switched optical signals corresponding to one or more of the generated optical signals (Takeda: col. 4, line 31 to col. 5, line 29).

(10) Response to Argument

Rejection Under 35 U.S.C. §103(a)

Claims 1-2, 4, 8-10, 14-20

In the brief page 11 line 16 to page 12 line 28, the Appellant notes that the Final Office Action of 31 March 2008 stated that Takeda's selector (fig. 3 element 27) disclosed Appellant's limitation of "at least one of said at least two optical pump signals is controllably modulated such that a logic sequence of said input data signal is controllably switched". However, the Appellant argues that the selector only performs selection of pump signals λ_{p1} and λ_{p2}, and does not disclose the limitation, further arguing that the cited portion of Takeda (col. 5 lines 6-22) is devoid of teaching or suggesting the limitation. However, Takeda col. 5 lines 20-22 in particular says "… by selectively switching the pump light under the control of the selector 27, the signal light of wavelength λ_s can be output as a converted light of wavelength λ_{c1} or λ_{c2}". The Appellant argues that this alternative selecting is not equal to modulating at least one of said at least two optical pump signals such that a logic sequence of said input data signal is controllably switched. The Appellant's argument is not persuasive.

The language "selection" used by Takeda covers both pump signals at once, from the perspective of *the selector*. When considering what is happening from the perspective of *one of the pump signals*, it is clear that the "selection" amounts to modulation of the pump signal. Specifically, the pump signal is allowed through the selector when it is selected, but is blocked by the selector when it is not selected. This

alternating pass/black action by the selector on the optical pump signal would be recognized by one of ordinary skill in the art as equivalent to the optical modulation type known as on-off keying ("OOK") or amplitude-shift keying, or more broadly, amplitude/intensity modulation. The fact that the selector is responsible for two pump signals, and is "selecting" in applying opposite pass/block states to the two different pump signals, does not change the fact that from the perspective of an individual pump signal, it is being amplitude modulated by the selector.

Jumping to the brief page 14 lines 6-18, the Appellant further argues that even assuming that the selection of pump signals could be interpreted as modulation, Takeda would still fail to teach that the logic sequence of the input data is controllably switched as a result of such modulation. However, this argument is not persuasive because the selection between the two pumps signals *does* result in a controllable switching of the logic sequence of the input data signal; namely, it results in a controllable switching of the *output wavelength* assigned to the logic sequence of the input data signal. Specifically, a portion of the logic sequence will be assigned wavelength λ_{c2} when the pump signal λ_{p2} is passed by the selector and another portion of the logic sequence will be assigned wavelength λ_{c1} when the pump signal λ_{p2} is blocked by the selector (because the other pump signal λ_{p1} will then be passed by the selector).

Returning to the brief page 12 line 29 to page 13 line 12, the Appellant also argues that having both pump sources of wavelengths λ_{p1} and λ_{p2} of Takeda active would be contrary to the principles of Takeda, and that Takeda thus teaches away from the limitation. This argument is not persuasive. As in initial matter, it appears the

Appellant meant to argue that having both pump sources of wavelengths λ_{p1} and λ_{p2} of Takeda *simultaneously selected* would be contrary to the principles of Takeda. After all, merely having both of Takeda's pump lasers "active" (i.e. powered up) is not contrary to the principles of Takeda, because the selector only selects one pump wavelength at a time. Even in this light, however, the Appellant's argument is still not persuasive, because the rejection does not attempt to have both pump sources of wavelengths λ_{p1} and λ_{p2} simultaneously selected. Rather, Takeda's pump wavelengths λ_{p1} and λ_{p2} alternate between opposing pass/block states, as described above, and for the combination an *additional* wavelength (based on the teaching of Bjarklev) is coupled with whichever pump wavelength of Takeda is currently being passed through the selector.

In the brief page 13 line 13 to page 14 line 5, the Appellant argues that Bjarklev and Cearns fail to bridge the gap between Takeda and the limitation. This argument is not persuasive, because there is no gap in Takeda, as already described above.

In the brief page 14 line 19 to 15 line 5, the Appellant further argues that the combination of Takeda and Bjarklev would still teach away from the limitation, arguing that the addition of a third pump signal based on teachings of Bjarklev would merely result in a system in which the selector of Takeda chooses one of three available pump signals. This argument is not persuasive because it does not address the actual combination of Takeda and Bjarklev as described in the rejection. The combination does not result in the selector choosing one of three pump signals. Rather, it results in Takeda's pump wavelengths λ_{p1} and λ_{p2} still alternating between opposing pass/block

states with respect to the selector, with an additional (third) wavelength (based on the teaching of Bjarklev) coupled with whichever pump wavelength of Takeda is currently being passed through the selector.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/NATHAN M CURS/

Examiner, Art Unit 2613

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